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AESO/SE
2-21-01-F-220 December 5, 2001

TO: Field Manager, Phoenix Field Office, Bureau of Land Management, Phoenix, Arizona

FROM: Field Supervisor

SUBJECT: Biological Opinion: Livestock Grazing on the Conley and Beloat Allotments

This biological opinion responds to your request for consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request for formal consultation was dated February 21, 2001, and received by us on February 23, 2001. At issue are the possible effects of the proposed livestock grazing on the Conley and Beloat allotments in Maricopa County, Arizona on the endangered cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*).

This biological opinion is based on information provided in the your February 21, 2001, request for consultation, the biological evaluation, and information in our files. A complete administrative record of this consultation is on file at this office.

Consultation History

The Bureau of Land Management (BLM) requested concurrence from the Service on their determination that livestock grazing on the Conley and Beloat allotments may affect, but is not likely to adversely affect, the cactus ferruginous pygmy-owl. Further, the BLM requested formal consultation be initiated if the Service did not concur with this determination. In a letter dated April 3, 2001, the Service informed the BLM that it did not concur that the proposed action may affect, but is not likely to adversely affect the pygmy-owl. In a memorandum dated July 18, 2001, the BLM requested that the Service suspend formal consultation and issue a biological opinion by December 1, 2001.

BIOLOGICAL OPINION

I. Description of Proposed Action

The BLM proposes to continue to authorize the existing grazing permits on the Conley and Beloat allotments at the established preferences. All supplemental ephemeral use will follow the policy described in BLM, Arizona State Office Instruction Memorandum AZ-94-018. Further, supplemental ephemeral use will follow the conditions outlined in Guideline 3-5 of the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration, which states that grazing on designated ephemeral (annual and perennial) rangeland may be authorized if the following conditions are met: 1) ephemeral vegetation is present in draws, washes, and under shrubs and has grown to useable levels at the time grazing begins; 2) sufficient surface and subsurface soil moisture exists for continued plant growth; 3) serviceable waters are capable of providing for proper grazing distribution; 4) sufficient annual vegetation will remain on site to satisfy other resource concerns (i.e., watershed, wildlife, wild horses and burros); and 5) monitoring is conducted during grazing to determine if objectives are being met.

When the current 10 year grazing permits for these allotments expire in 2005, the BLM will conduct a detailed allotment evaluation and implement the “Arizona Standards for Rangeland Health and Guidelines for Grazing Administration” prior to reauthorization of the permit. Additionally, the BLM will be undergoing a land use planning process for the newly designated Sonoran Desert National Monument which includes a substantial portion of these allotments.

No new range improvements or facilities are proposed. Maintenance of existing facilities within ½ mile of suitable pygmy-owl habitat would be carried out as needed but restricted to July 1 to December 31 to avoid potential effects to breeding pygmy-owls. Utilization will be limited to 20% on perennial grasses, trees, and shrubs in the North and South Maricopa Mountains Wilderness areas, and 30% on the remainder of the allotment.

Both of these allotments are classified perennial/ephemeral which means they have year-long permitted use and can run additional livestock, normally steers, in years of high winter/spring rainfall. Ephemeral authorization is in addition to the year-long grazing preference currently permitted in the 10-year grazing permit. The Conley allotment is permitted to stock 350 cattle year-long and the Beloat allotment is permitted to stock 300 cattle year-long.

The number of animals authorized for ephemeral use varies greatly between years and between allotments depending upon forage production, market conditions, and availability of steers. The actual year-long use on these two allotments varies from year to year based on resource and livestock market conditions.

The Conley allotment includes 91,586 acres of BLM-administered lands, 879 acres of State of Arizona administered lands and 26,020 acres of private land, for a total of 118,485 acres. The allotment is located in southwestern Maricopa County and includes the community of Mobile, AZ, much of the Mobile Valley, the southeastern portion of the North Maricopa Mountains Wilderness area and the northeastern portion of the South Maricopa Mountains Wilderness area. Ecological condition and trend on the allotment are presented in Table 1 and the actual use in Animal Unit Months (AUMs) for the past 10 years in presented in Table 2. This allotment is divided into 3 pastures. Livestock use is heaviest in the flatter valley bottom and lighter in the more mountainous areas. Monitoring data for this allotment indicate that utilization on palatable shrubs, grasses and trees is less than 15%.

Table 1. Ecological condition and trend on the Conley and Beloat allotments, Maricopa County, Arizona.

Condition and Trend	Conley Allotment (%)	Beloat Allotment (%)
Condition		
Potential Natural Community	12%	11%
Later Seral Stage	66%	63%
Mid Seral Stage	20%	24%
Early Seral Stage	2%	2%
Trend		
Up	19%	37%
Static	73%	61%
Down	8%	2%

The Beloat allotment includes 103,508 acres of BLM-administered lands, 20,801 acres of State of Arizona administered lands and 200 acres of private land, for a total of 124,509 acres. The allotment is located in southwestern Maricopa County immediately north of the Conley allotment and includes the Rainbow Valley, the western portion of the Sierra Estrella Mountains including all of the Estrella Mountains Wilderness area and the northeastern portion of the North Maricopa Mountains Wilderness area. Ecological condition and trend on the allotment are presented in Table 1 and the actual use in AUMs for the past 10 years in presented in Table 2. Livestock use is heaviest in the flatter valley bottom and lighter in the more mountainous areas. Monitoring data for this allotment indicate that utilization on palatable shrubs, grasses and trees is less than 15%.

Table 2. Actual use in Animal Unit Months (AUMs) for the past 10 years on the Conley and Beloat allotments, Maricopa, County, Arizona.

	Conley allotment		**Beloat allotment**	
Year	Year-long Actual Use	Ephemeral Use	Year-long Actual Use	Ephemeral Use
92-93	675	4,200	1,494	7,875
93-94	4,158	16,441	1,492	0
94-95	1,236	2,399	2,988	1,519
95-96	1,112	10,995	2,988	3,329
96-97	2,111	1,403	2,988	0
97-98	790	419	135	0
98-99	4,158	8,223	1,494	0
99-00	4,158	0	1,693	0
00-01	4,158	0	2,988	0

Pygmy-owl Conservation Measures

The BLM has committed to implement conservation measures to better manage habitat for the cactus ferruginous pygmy-owl such as, maintaining habitat features and the habitat necessary to support pygmy-owls, as well as discussing pygmy-owl habitat and features with the Service.

The BLM Phoenix Field Office funded pygmy-owl surveys in various locations throughout southcentral Arizona, including these 2 allotments, during the spring of 2001.

II. Status of the Species

Cactus Ferruginous Pygmy-Owl (*Glaucidium brasilianum cactorum*)

A detailed description of the life history and ecology of the pygmy-owl may be found in the Birds of North America (Proudfoot and Johnson 2000), Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona (Cartron and Finch 2000), and other information available at the Arizona Ecological Services Field Office. Information specific to the pygmy-owl in Arizona is limited. Research in Texas has provided useful insights into the ecology of the subspecies, and in some instances represents the best available information; however, habitat and environmental conditions are somewhat different in Arizona and conclusions based on Texas information are tentative.

Species description

The Service listed the Arizona population of the pygmy-owl as a distinct population segment (DPS) on March 10, 1997, effective April 9, 1997 (U.S. Fish and Wildlife Service 1997 [62 FR 10730]). The past and present destruction, modification, or curtailment of habitat is the primary reason for the decrease in population levels of the pygmy-owl. On July 12, 1999 we designated approximately 731,712 acres of critical habitat supporting riverine, riparian, and upland vegetation in seven critical habitat units, located in Pima, Cochise, Pinal, and Maricopa counties in Arizona (U.S. Fish and Wildlife Service 1999 [64 FR 37419]). However, on September 21, 2001, the U.S. District Court for the District of Arizona vacated this final rule designating critical habitat for the pygmy-owl, and remanded its designation back to the Service for further consideration.

Life history

Pygmy-owls are small birds, averaging 6.75 inches in length. Pygmy-owls are reddish-brown overall, with a cream-colored belly streaked with reddish-brown. The pygmy-owl is crepuscular/diurnal, with a peak activity period for foraging and other activities at dawn and dusk. During the breeding season, they can often be heard calling throughout the day, but most activity is reported between one hour before sunrise to two hours after sunrise, and late afternoon/early evening from two hours before sunset to one hour after sunset (Collins and Corman 1995).

A variety of vegetation communities are used by pygmy-owls, such as: riparian woodlands, mesquite (*Prosopis* spp.) “bosques” (Spanish for woodlands), Sonoran desertscrub, and semidesert grassland communities, as well as nonnative vegetation within these communities. While plant species composition differs among these communities, there are certain unifying characteristics such as the presence of vegetation in a fairly dense thicket or woodland, the presence of trees or saguaros large enough to support cavity nesting, and elevations below 4,000 ft. Historically, pygmy-owls were associated with riparian woodlands in central and southern Arizona. Plants present in these riparian communities include cottonwood, willow (*Salix* spp.) and hackberry (*Celtis* spp.). Cottonwood trees are suitable for cavity nesting, while the density of mid- and lower-story vegetation provides necessary protection from predators and an abundance of prey items for the pygmy-owl. Mesquite bosque communities are dominated by mesquite trees, and are described as mesquite forests due to the density and size of the trees.

Over the past several decades, pygmy-owls have been primarily found in the Arizona Upland Subdivision of the Sonoran Desert, particularly Sonoran Desertscrub (Brown 1994). This community in southern Arizona consists of paloverde, ironwood, mesquite, acacia, bursage (*Ambrosia* spp.), and columnar cacti (Phillips et al. 1964, Monson and Phillips 1981, Davis and Russell 1999, Johnson and Haight 1985, Johnsgard 1988). However, over the past several years, pygmy-owls have also been found in riparian and xeroriparian habitats and semidesert grasslands as classified by Brown (1994). Desert scrub communities are characterized by an abundance of saguaros or large trees, and a diversity of plant species and vegetation strata. Xeroriparian habitats contain a rich diversity of plants that support a wide array of prey species and provide cover. Semidesert grasslands have experienced the invasion of velvet mesquites (*Prosopis velutina*) in uplands and linear woodlands of various tree species along bottoms and washes.

The density of trees and the amount of canopy cover preferred by pygmy-owls in Arizona is unclear. However, preliminary results from a habitat selection study indicate that nest sites tend to have a higher degree of canopy cover than random sites (Wilcox et al. 2000). For areas outside Arizona, pygmy-owls are most commonly characterized by semi-open or open woodlands, often in proximity to forests or patches of forests. Where they are found in forested areas, they are typically observed along edges or in openings, rather than deep in the forest itself (Binford 1989, Sick 1993), although this may be a bias of increased visibility. Overall, vegetation density may not be as important as patches of dense vegetation with a developed canopy layer interspersed with open areas. The physical settings and vegetation composition varies across *G. brasilianum's* range and, while vegetation structure may be more important than composition (Wilcox et al. 1999, Cartron et al. 2000a), higher vegetation diversity is found more often at nest sites than at random sites (Wilcox et al. 2000).

Pygmy-owls typically hunt from perches in trees with dense foliage using a perch-and-wait strategy; therefore, sufficient cover must be present within their home range for them to successfully hunt and survive. Their diverse diet includes birds, lizards, insects, and small mammals (Bendire 1888, Sutton 1951, Sprunt 1955, Earhart and Johnson 1970, Oberholser 1974) and frogs (Proudfoot et al. 1994). The density of annuals and grasses, as well as shrubs, may be important to the pygmy-owl's prey base. Shrubs and large trees also provide protection against aerial predation for juvenile and adult pygmy-owls and cover from which they may capture prey (Wilcox et al. 2000).

Pygmy-owls are considered non-migratory throughout their range by most authors, and have been reported during the winter months in several locations, including Organ Pipe Cactus National Monument (OPCNM) (R. Johnson unpubl. data, T. Tibbitts, OPCNM unpubl. data). Pygmy-owls begin nesting activities in late winter to early spring. In Arizona differences between nest sites may vary by as much as two months (Abbate et al. 1996, S. Richardson, Arizona Game and Fish Department [AGFD] unpubl. data). As with other avian species, this may be the result of a second brood or a second nesting attempt following an initial failure (Abbate et al. 1996). In Texas, juveniles remained within approximately 165 feet of adults until dispersal. Dispersal distances (straight line) of 20 juveniles monitored from their natal sites to nest sites the following year averaged 5 miles (ranged from 0.75 to 19 miles, G. Proudfoot unpubl. data). Telemetry studies of dispersing juveniles in Arizona during 1999 and 2000 ranged from 1.4 to 12.9 miles (straight line distance) (n=6, mean 6.2 miles) in 1999, and 1.6 to 11.7 miles (n=6, mean 5.8 miles) in 2000 (S. Richardson and M. Ingraldi, AGFD unpubl. data). Pygmy-owl telemetry studies have documented movement of owls between southern Pinal County and northwestern Tucson (S. Richardson and M. Ingraldi, AGFD unpubl. data). Juveniles typically dispersed from natal areas in July but did not appear to defend a territory until September. They may move up to one mile in a night; however, they typically fly short distances from tree to tree instead of long single flights (S. Richardson, AGFD unpubl. data). Subsequent surveys during the spring have found that locations of male pygmy-owls are in the same general location as last observed the preceding fall.

Apparently unpaired females may also remain in the same territory for some period of time. In the spring of 2001, an unpaired female (the male died in 2000) remained in its previous years' territory well into the spring, exhibiting territorial behavior (calling) for 2 months until ultimately switching territories and paring with an unpaired male and successfully nesting (S. Richardson, AGFD unpubl. data). Researchers suspect that if this unpaired female could have attracted an unpaired male during that time, she would have likely remained in her original territory. Apparently at some point the urge to pair is too strong to remain and they seek out new mates.

In Texas, Proudfoot (1996) noted that, pygmy-owls used between 3 and 57 acres during the incubation period, and they defend areas up to 279 acres in the winter. Therefore, a 280 acre home range is considered necessary for pygmy-owls. Proudfoot and Johnson (2000) indicate males defend areas with radii from 1,100 - 2,000 feet. Initial results from ongoing studies in Texas indicate that the home range of pygmy-owls may also expand substantially during dry years (G. Proudfoot unpubl. data).

Species status and distribution range wide

The pygmy-owl is one of four subspecies of ferruginous pygmy-owl. Pygmy-owls are known to occur from lowland central Arizona south through western Mexico to the States of Colima and Michoacan, and from southern Texas south through the Mexican States of Tamaulipas and Nuevo Leon. It is unclear at this time if the ranges of the eastern and western populations of the ferruginous pygmy-owl merge in southern Mexico. Recent genetic studies suggest that ferruginous pygmy-owl populations in southern Arizona and southern Texas are distinct subspecies, and that there is no genetic isolation between populations in the United States and those immediately south of the border in northwestern or northeastern Mexico (Proudfoot and Slack 2001). Results also indicate a comparatively low haplotypic diversity in the northwestern Tucson population, suggesting that it may be recently separated from those in the Altar Valley, Arizona, and in Sonora and Sinaloa, Mexico.

The Service is currently funding habitat studies and surveys in Sonora, Mexico to determine the distribution and relative abundance of the pygmy-owl there. Based on the lack of sightings, they may be rare or uncommon in northern Sonora, Mexico (Hunter 1988, U.S. Fish and Wildlife Service 1997). Preliminary results indicate that pygmy-owls are present in northern and central Sonora (U.S. Fish and Wildlife Service unpubl. data). Further studies are needed to determine their distribution in Mexico.

The range of the Arizona DPS of the pygmy-owl extends from the International Border with Mexico north to central Arizona. The northernmost historic record for the pygmy-owl is from

New River, Arizona, about 35 miles north of Phoenix, where Fisher (1893) reported the pygmy-owl to be "quite common" in thickets of intermixed mesquite and saguaro cactus. According to early surveys referenced in the literature, the pygmy-owl, prior to the mid-1900s, was "not uncommon," "of common occurrence," and a "fairly numerous" resident of lowland central and southern Arizona in cottonwood forests, mesquite-cottonwood woodlands, and mesquite bosques along the Gila, Salt, Verde, San Pedro, and Santa Cruz rivers and various tributaries (Breninger 1898, Gilman 1909, Swarth 1914). Additionally, pygmy-owls were detected at Dudleyville on the San Pedro River as recently as 1985 and 1986 (AGFD unpubl. data, Hunter 1988).

Records from the eastern portion of the pygmy-owl's range include a 1876 record from Camp Goodwin (nearby current day Geronimo) on the Gila River, and a 1978 record from Gillard Hot Springs, also on the Gila River. Pygmy-owls have been found as far west as the Cabeza Prieta Tanks, Yuma County, in 1955 (Monson 1998).

Hunter (1988) found fewer than 20 verified records of pygmy-owls in Arizona for the period of 1971 to 1988. Formal surveys for the pygmy-owl on OPCNM began in 1990, with one located that year. Beginning in 1992, survey efforts conducted in cooperation with the AGFD, located three single pygmy-owls on OPCNM (U.S. Fish and Wildlife Service and OPCNM unpubl. data). In 1993, surveys were conducted at locations where pygmy-owls had been sighted since 1970. Only one pygmy-owl was detected during these survey periods, and it was located in northwestern Tucson (Felley and Corman 1993). In 1994, a pair and single owl of unknown breeding status were located in northwestern Tucson during informal survey work by AGFD (Abbate et al. 1996). In 1995, AGFD confirmed 5 adult pygmy-owl and one juvenile, one of which was the first nest in many years. In 1996, AGFD focused their survey efforts in the Tucson Basin. A total of 12 pygmy-owls were detected, including one known nesting pair and their 2 fledglings, which successfully fledged. Three additional pygmy-owls and three other unconfirmed reports were also recorded at OPCNM in 1996.

While the majority of Arizona pygmy-owl detections in the last seven years have been from the northwestern Tucson area in Pima County, pygmy-owls have also been detected in southern Pinal County, at OPCNM, Cabeza Prieta National Wildlife Refuge (CPNWR), Buenos Aires National Wildlife Refuge (BANWR), and on the Coronado National Forest. The following is a brief summary of recent owl numbers and distribution[1]:

In 1997, survey efforts of AGFD located a total of five pygmy-owls in the Tucson Basin study area (the area bounded to the north by the Picacho Mountains, the east by the Santa Catalina and Rincon mountains, the south by the Santa Rita and Sierrita mountains, and the Tucson Mountains to the west). Of these owls, one pair successfully fledged two young which were banded. Two

[1] To a large degree, survey effort plays an important factor in where owls have been documented. Survey effort has not been consistent over the past several years in all areas of the state, affecting the known distribution and numbers of owls in any particular area.

adult males were also located at OPCNM, with one reported from a previously unoccupied area (T. Tibbitts, OPCNM pers. comm. 1997).

In 1998, survey efforts in Arizona increased substantially and, as a result, more pygmy-owls were documented, which may at least in part account for a larger number of known owls. In 1998, a total of 35 pygmy-owls were confirmed (S. Richardson, AGFD unpubl. data, U.S. Fish and Wildlife Service unpubl. data, T. Tibbitts, OPCNM unpubl. data, D. Bieber, Coronado National Forest unpubl. data).

In 1999, a total of 41 adult pygmy-owls were found in Arizona at 28 sites. Of these sites, 11 had nesting confirmed by AGFD and the Service. Pygmy-owls were found in three distinct regions of the state: Tucson Basin, Altar Valley, and OPCNM. Almost half of the know owl sites were in the Altar Valley. Overall, mortality was documented for a number of fledglings due to natural (e.g., predation) or unknown causes. Of the 33 young found, only 16 were documented as surviving until dispersal (juveniles known to have successfully dispersed from their natal area). It is unclear what the survival rate for pygmy-owls is; however, as with other owls and raptors, a high mortality (50% or more) of young is typical during the first year of life.

Surveys conducted in 2000 resulted in 24 confirmed pygmy-owl sites (i.e. nests and resident pygmy-owl sites) and several other unconfirmed sites (S. Richardson, AGFD unpubl. data, T. Tibbitts, OPCNM unpubl. data, U.S. Fish and Wildlife Service unpubl. data). A total of 34 adult pygmy-owls were confirmed. Nesting was documented at 7 sites and 23 fledglings were confirmed; however, as in 1999, over a 50% fledgling mortality was documented (S. Richardson, AGFD unpubl. data). A total of 9 juveniles were known to have successfully dispersed from their natal areas in 2000. Successful dispersal was not confirmed at two nests with four fledglings. The status of the remaining fledglings was unknown; however, they were presumed dead.

Surveys conducted during the recently completed 2001 season resulted in a total of 46 adult pygmy-owls confirmed at 29 sites[2] in Arizona (S. Richardson, AGFD unpubl. data, T. Tibbitts, OPCNM unpubl. data, U.S. Fish and Wildlife Service unpubl. data). There were also several other unconfirmed sites that are not included in these totals. Nesting was documented at 17 sites; it is unknown at this time how many young have successfully fledged. The following regions of the state are currently known to support pygmy-owls:

- **Tucson Basin** (northwestern Tucson and southern Pinal County) - A total of 8 adults (3 pairs and 2 single males) were confirmed at 5 sites, all of which were in Pima County. For the first time in 3 years, no pygmy-owls were documented in southern Pinal County. Three nests in northwestern Tucson were confirmed, all with young.

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[2] Pygmy-owl sites are nests and resident male pygmy-owl sites that have been confirmed by AGFD or the Service.

- **Altar Valley** - A total of 19 adult pygmy-owls were documented at 12 sites. As a result of increased access to portions of the valley, the number of known owls increased to 7 pairs and 5 resident single owls. A total of 7 nests were confirmed.

- **OPCNM and CPNWR** - Ten adults, consisting of 3 pairs and 4 single pygmy-owls were confirmed at 7 sites. Three nests were active. Two new sites were documented on the CPNWR.

- **Other** - A total of 9 adults, consisting of 4 pairs and 1 single pygmy-owl at 5 sites documented elsewhere in southern Arizona. Nesting was confirmed at 4 of these sites. It is unknown how many of these young successfully dispersed. There were several other possible pygmy-owl detections reported elsewhere in the state, but they were not confirmed.

One factor affecting the known distribution of pygmy-owls in Arizona is where early naturalists spent most of their time and where recent surveys have taken place. For example, a majority of surveys in the recent past (since 1993) have taken place in OPCNM and in the Tucson Basin, and these areas are where most owl locations have been recorded. However, over the past three years, large, previously unsurveyed areas have been inventoried for owls, resulting in a much wider distribution than previously thought. As a result, our knowledge is changing as to pygmy-owl distribution and habitat needs as new information is collected. For example, before 1998, very few surveys had been completed in the Altar Valley in southern Pima County. Prior to 1999, the highest known concentration of pygmy-owls in the state was in northwestern Tucson. However, in 1999, after extensive surveys in Altar Valley, more owls were found there (18 adults) than in northwestern Tucson (11 adults), although until 2001, there have been fewer nest sites in Altar Valley than in the Tucson Basin (S. Richardson, AGFD unpubl. data).

Range wide trend

One of most urgent threats to pygmy-owls in Arizona is thought to be the loss and fragmentation of habitat (U.S. Fish and Wildlife Service 1997, Abbate et al. 1999). The complete removal of vegetation and natural features required for many large scale and high-density developments directly and indirectly impacts pygmy-owl survival and recovery (Abbate et al. 1999).

Habitat loss, degradation, and fragmentation are widely accepted causes contributing to raptor population declines worldwide (Snyder and Snyder 1975, Newton 1979, LeFranc and Millsap 1984). Habitat fragmentation is the process by which a large and continuous block of natural habitat is transformed into much smaller and isolated patches by human activity (Noss and Csuti 1994). Fragmentation has two components (1) reduction of the total amount of habitat type and (2) apportionment of remaining habitat into smaller, more isolated patches (Harris 1984, Wilcove et al. 1986, Saunders et al. 1991).

Nesting in small natural patches may have additional risks. For example, Haug (1985) found burrowing owl home range size increases with the percentage of vegetation disturbance. In fragmented landscapes, burrowing owls may forage greater distances and spend more time away from the nest, making them more vulnerable to predators, and therefore, less efficient at reproduction (Warnock and James 1997). As fragmentation increases, competition for fewer productive pygmy-owl territories may occur (Abbate et al. 1999). Unlike other larger birds that can fly long distances over unsuitable or dangerous areas to establish new territories, pygmy-owls, because of their small size and their short style of flight, are exposed to greater risks from predation and other threats (Abbate et al. 1999).

Site tenacity in birds is one of many factors that may create time lags in response to fragmentation and other disturbances. Individuals may remain in sites where they bred successfully in the past, long after the habitat has been altered (Wiens 1985). Because of lack of data, it is unclear whether site tenacity for pygmy-owls is a factor in the increasingly fragmented landscapes that exists in the action area. For example, researchers have been closely monitoring an established pygmy-owl site (documented each year since 1996) in which the male died in 1999, apparently from a collision with a fence (S. Richardson, AGFD unpubl. data.). This site was not known to be occupied since 1999. This site has the highest amount of development (33%) within its estimated home range of any other known nest site (S. Richardson, AGFD unpubl. data.). The site will continued to be monitored to determine if new owls reestablish a nest site.

In northwestern Tucson, all currently known pygmy-owl locations, particularly nest sites, are in low-density housing areas where abundant native vegetation separates structures. Additionally, they are adjacent to or near large tracts of undeveloped land. Pygmy-owls appear to use non-native vegetation to a certain extent, and have been observed perching in non-native trees in close proximity to individual residences. However, the persistence of pygmy-owls in areas with an abundance of native vegetation indicates that a complete modification of natural conditions likely results in unsuitable habitat conditions for pygmy-owls. While development activities are occurring in close proximity to owl sites, particularly nest sites, overall noise levels are low. Housing density is low, and as a result, human presence is also generally low. Roads in the areas are typically dirt or two-lane paved roads with low speed limits that minimize traffic noise. Low density housing areas generally have lower levels of traffic noise because of the limited number of vehicles traveling through the area.

Other factors contributing to the decline of pygmy-owl habitat include the destruction of riparian bottomland forests and bosques. It is estimated that 85 to 90% of low-elevation riparian habitats in the southwestern U.S. have been modified or lost; these alterations and losses are attributed to woodcutting, non-native plant invasion, urban and agricultural encroachment, water diversion and impoundment, channelization, groundwater pumping, livestock overgrazing, and hydrologic changes resulting from various land-use practices (e.g., Phillips et al. 1964, Carothers 1977, Kusler 1985, Jahrsdoerfer and Leslie 1988, U.S. Fish and Wildlife Service 1988, U.S. General Accounting Office 1988, Szaro 1989, Dahl 1990, State of Arizona 1990, Bahre 1991). Cutting of trees for domestic and industrial fuel wood was so extensive throughout southern Arizona that, by the late 19th century, riparian forests within tens of miles of towns and mines had been decimated (Bahre 1991). Mesquite was a favored species because of its excellent fuel qualities. In the project area, the famous vast forests of "giant mesquites" along the Santa Cruz River in the Tucson area described by Swarth (1905) and Willard (1912) fell to this threat, as did the "heavy mesquite thickets" where Bendire (1888) collected pygmy-owl specimens along Rillito Creek, a Santa Cruz River tributary, in present-day Tucson. Only remnant fragments of these bosques remain.

Regardless of past distribution in riparian areas, it is clear that the pygmy-owl has declined throughout Arizona to the degree that it is now extremely limited in distribution in the state (Johnson et al. 1979, Monson and Phillips 1981, Davis and Russell 1999, Johnson-Duncan et al. 1988, Millsap and Johnson 1988, Monson 1998). A very low number of pygmy-owls in riparian areas in recent years may reflect the loss of habitat connectivity rather than the lack of suitability (Cartron et al. 2000b).

In recent decades, the pygmy-owl's riparian habitat has continued to be modified and destroyed by agricultural development, woodcutting, urban expansion, and general watershed degradation (Phillips et al. 1964, Brown et al. 1977, State of Arizona 1990, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a and 1993b). Sonoran desertscrub has been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991). Pumping of groundwater and the diversion and channelization of natural watercourses are also likely to have reduced pygmy-owl habitat. Diversion and pumping result in diminished surface flows, and consequent reductions in riparian vegetation are likely (Brown et al. 1977, Stromberg et al. 1992, Stromberg 1993a and 1993b). Channelization often alters stream banks and fluvial dynamics necessary to maintain native riparian vegetation. The series of dams along most major southwestern rivers (e.g., Colorado, Gila, Salt, and Verde rivers) have altered riparian habitat downstream of dams through hydrological and vegetational changes, and have inundated former habitat upstream.

In the United States, pygmy-owls are rare and highly sought by bird watchers, who concentrate at a few of the remaining known locations. Limited, conservative bird watching is probably not harmful; however, excessive attention and playing of tape-recorded calls may at times constitute harassment and affect the occurrence and behavior of the pygmy-owl (Oberholser 1974, Tewes 1993). For example, in 1996, a resident in Tucson reported a pygmy-owl sighting which subsequently was added to a local birding hotline and the location was added to their website on the internet. Several car loads of birders were later observed in the area of the reported location (S. Richardson, AGFD pers. comm. 1999).

One of the few areas in Texas known to support pygmy-owls continues to be widely publicized as having organized field trips and birding festivals (American Birding Association 1993, Tropical Birds of the Border 1999). Resident pygmy-owls are found at this highly visited area only early in the breeding season, while later in the season they could not be detected. O'Neil (1990) also indicated that five birds initially detected in southern Texas failed to respond after repeated visits by birding tours. It is unknown if the birds habituate to the playing of taped calls and stopped responding, or if they abandoned the area. Oberholser (1974) and Hunter (1988) additionally indicated that in southern Texas recreational birdwatching may disturb owls at highly visited areas.

Human activities near nests at critical periods of the nesting cycle may cause pygmy-owls to abandon their nest sites. In Texas, 3 of 102 pygmy-owl nests monitored from 1994-1999 were abandoned during the early stage of egg laying. Although unknown factors may have contributed to this abandonment, researchers in Texas associated nest abandonment with nest monitoring (G. Proudfoot pers. comm.). Some outdoor recreational activities (e.g., off road vehicle [ORV] and motor bike use/racing, firearm target practicing, jeep tours, etc.) may disturb pygmy-owls during their breeding season (particularly from February through July, G. Proudfoot pers. comm. 1999 and S. Richardson, AGFD pers. comm. 1999). Noise disturbance during the breeding season may affect productivity; disturbance outside of this period may affect the energy balance and, therefore survival. Wildlife may respond to noise disturbances during the breeding season by abandoning their nests or young (Knight and Cole 1995). It has also become apparent that disturbance outside of a species' breeding season may have equally severe effects (Skagen et al. 1991).

Individual pygmy-owls may react differently to noise disturbances, some individuals exhibiting less tolerance than others. Noise can affect animals by disturbing them to the point that detectable change in behavior may occur. Such behavioral changes can affect their activity and energy consumption (Bowles 1995). Dangerous or unfamiliar noises are more likely to arouse wildlife than harmless and familiar noises. Habituation is the crucial determinant of success in the presence of noisy disturbances. Exposures of some experienced birds may produce no or minimal losses (Black et al. 1984). The habituation process can occur slowly, so it may not be detected in the short-term. In the long-term, some nesting birds become more tenacious and less responsive in the presence of human disturbance if they are not deliberately harassed (Burger and Gochfeld 1981). It is unknown if noise habituation occurs in some pygmy-owls as it does with other bird species. Robert and Ralph (1975), Schreiber et al. (1979), Cooke (1980), Parsons and Burger (1982), Ainley et al. (1983), and McNicholl (1983) found that adult birds, and chicks to some extent, habituated to the presence of humans, and their responses to people seemed to be less than those of undisturbed birds. Burger and Gochfeld (1981) and Knight et al. (1987) found responses to noise disturbances and habituation in nesting birds become more tenacious and less responsive in the presence of human disturbance if they were not deliberately harassed.

Raptors in frequent contact with human activities tend to be less sensitive to additional noise disturbances than raptors nesting in remote areas. However, exposure to direct human harassment may make raptors more sensitive to noise disturbances (Newton 1979). Where prey is abundant, raptors may even occupy areas of high human activity, such as cities and airports (Newton 1979, Ratcliffe 1980, White et al. 1988). The timing, frequency, and predictability of the noise disturbance may also be factors. Raptors become less sensitive to human disturbance as their nesting cycle progresses (Newton 1979). Studies have suggested that human activities within breeding and nesting territories could affect raptors by changing home range movements

(Anderson et al. 1990) and causing nest abandonment (Postovit and Postovit 1987, Porter et al. 1973).

Application of pesticides and herbicides in Arizona occurs year-round, and these chemicals pose a potential threat to the pygmy-owl. The presence of pygmy-owls in proximity to residences, golf courses, agricultural fields, and nurseries may cause direct exposure to pesticides and herbicides. Furthermore, ingestion of affected prey items may cause death or reproductive failure (Abbate et al. 1999). Illegal dumping of waste also occurs in areas occupied by pygmy-owls and may be a threat to pygmy-owls and their prey; in one case, drums of toxic solvents were found within one mile of a pygmy-owl detection (Abbate et al. 1999).

Little is known about the rate or causes of mortality in pygmy-owls; however, they are susceptible to predation from a wide variety of species. In Texas, eggs and nestlings were depredated by racoons (*Procyon lotor*) and bullsnakes (*Pituophis melanoleucus*). Both adult and juvenile pygmy-owl are likely killed by great horned owls (*Bubo virginianus*), Harris' hawks *(Parabuteo unicinctus*), Cooper's hawks, and eastern screech-owls (*Otus asio*) (Proudfoot and Johnson 2000, G. Proudfoot unpubl. data). Pygmy-owls are particularly vulnerable to predation and other threats during and shortly after fledging (Abbate et al. 1999). Therefore, cover near nest sites may be important for young to fledge successfully (Wilcox et al. 1999, Wilcox et al. 2000). Although nest depredation has not been recorded in Arizona, only a few nests have been monitored (n = 21 from 1996-1999). Additional research is needed to determine the effects of predation, including nest depredation, on pygmy-owls in Arizona and elsewhere.

Another factor that may affect pygmy-owls is interspecific competition/predation. In Texas, depredation of two adult female pygmy-owls nesting close to screech-owls was recorded. These incidences were recorded as "depredation by screech-owl" after examination of the pygmy-owl corpses and assessment of circumstances (i.e., one pygmy-owl attempted to nest in a box that was previously used as screech-owl roost site, the other established a nest in a box within 16 feet of screech-owl nest site). In 2001, an unpaired female pygmy-owl was found dead in a tree cavity, apparently killed by a screech-owl (S. Richardson, AGFD unpubl. data). Conversely, pygmy-owls and screech-owls have also been recorded successfully nesting within 7 feet of each other in the same tree without interspecific conflict (G. Proudfoot, unpubl. data). The relationship between pygmy-owl and other similar small owl species needs further study.

Direct and indirect human-caused mortalities (e.g., collisions with cars, glass windows, fences, power lines, domestic cats [*Felis domesticus*], etc.), while likely uncommon, are often underestimated, and probably increase as human interactions with owls increase (Banks 1979, Klem 1979, Churcher and Lawton 1987). This may be particularly important in the Tucson area where many pygmy-owls are located. Pygmy-owls flying into windows and fences, resulting in serious injuries or death to the birds, have been documented twice. A pygmy-owl collided into a closed window of a parked vehicle; it eventually flew off, but had a dilated pupil in one eye indicating serious neurological injury as the result of this encounter (Abbate et al. 1999). In another incident, an adult owl was found dead on a fence wire; apparently it flew into a fence and died (S. Richardson, AGFD, unpubl. data). AGFD also has documented an incident of individuals shooting BB guns at birds perched on a saguaro which contained an active pygmy-owl nest. In Texas, two adult pygmy-owls and one fledging were killed by a domestic cat. These owls used a nest box about 246 feet from a human residence. Free roaming cats can also affect the number of lizards, birds, and other prey species available to pygmy-owls; however, very little research has been done in the Southwest on this potential problem.

Because pygmy-owls have been observed moving around the perimeter of golf courses, avoiding non-vegetated areas, roads and other openings may act as barriers to their movements (Abbate et al. 1999, S. Richardson, AGFD unpubl. data). On one occasion, a radio-tagged dispersing juvenile stopped within 0.7 mile of Interstate 10 where there were large openings and few trees or shrubs, and reversed its direction (Abbate et al. 1999). However, radio-tagged, juvenile pygmy-owls have been observed on several occasions crossing two-lane roads with light to moderately heavy vehicular traffic, where trees and large shrubs were present on either side (Abbate et al. 1999).

Fires can affect pygmy-owls by altering their habitat (Abbate et al. 1999). A recent fire altered habitat near an active pygmy-owl nest site (Flesch 1999) and although four mature saguaros in the area survived (at least in the short-term), post-fire mortality of saguaros has been recorded (Steenbergh and Lowe 1977 and 1983, Mclaughlin and Bowers 1982, Esque et al. 2000). Flesch (1999) also noted that approximately 20 to 30% of the mesquite woodland within 164 feet of the nest was fire- or top-killed, and ground cover was also eliminated until the summer monsoons. Careful use of prescribed fires in areas potentially suitable for pygmy-owls is necessary so that habitat is not lost or degraded (Flesch 1999).

Low genetic variability can lead to a reduction in reproductive success and environmental adaptability. Caughley and Gunn (1996) further note that small populations can become extinct entirely by chance even when their members are healthy and the environment favorable. The pairing of siblings or parents with their offspring, particularly in raptors, is rare, and has been documented in only 18 cases, representing 7 species (Carlson et al. 1998). Four of these species were owls: barn owls, burrowing owls (*Athene cunicularia*), screech-owls, and spotted owls (*Strix occidentalis*). In 1998 and 1999, two cases of sibling pygmy-owls pairing and breeding were documented (Abbate et al. 1999). In both cases, young were fledged from the nesting attempts. These unusual pairings may have resulted from extremely low numbers of available mates within their dispersal range, and/or from barriers (including fragmentation of habitat) that has influenced dispersal and limited the movement of young owls (Abbate et al. 1999). Further, because the pygmy-owl is nonmigratory, there may be an additional limitation on the flow of genetic material between populations which may reduce the chance of demographic and genetic rescue from immigration from adjacent populations.

Environmental, demographic, and genetic stochasticity, and catastrophes have been identified as interacting factors that may contribute to a population's extinction (Hunter 1996). Environmental stochasticity refers to random variation in habitat quality parameters such as climate, nutrients, water, cover, pollutants, and relationships with other species such as prey, predators, competitors, or pathogens. Demographic stochasticity is uncertainty due to random variation in reproductive success and survivorship of individuals. Genetic stochasticity is the random variation in gene frequencies of a population due to genetic drift, bottlenecks, inbreeding, and similar factors. Catastrophes are events such as droughts or hurricanes that occur randomly. When these factors interact with one another, there are likely to be a combination of effects, such that a random environmental change like habitat fragmentation can result in population and genetic changes by preventing dispersal. These factors are much more likely to cause extinction when a species' numbers are already extremely low. The small, fragmented population of pygmy-owls in Arizona may not have the ability to resist change or dramatic fluctuations over time caused by one or more of the factors mentioned above.

Soule (1986) notes that very small populations are in extreme jeopardy due to their susceptibility to a variety of factors, including demographic stochasticity, where chance variations in birth and death rates can result in extinction. A series of environmental changes such as habitat reduction reduce populations to a state in which demographic stochasticity takes hold. In small populations such as with the pygmy-owl, each individual is important for its contributions to genetic variability of that population. As discussed above, low genetic variability can lead to a lowering in reproductive success and environmental adaptability, affecting recovery of this species.

III. Environmental Baseline

The environmental baseline includes past and present impacts of all Federal, state, or private actions in the action area; the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation; and the impact of state and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Definition of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The Service has determined the action area to include the project site and areas within 19 miles of the project site. We based this determination on the dispersal distance of juvenile pygmy-owls in Texas and Arizona (Proudfoot unpubl. data, S. Richardson, AGFD unpubl. data).

Action Area - Climate, Terrain, and Vegetation Communities

The climate of the action area can be described as semiarid or semi-desert. It is typified by relatively little annual rainfall (< 10 in), high summer temperatures, intense solar radiation, low humidity, and high evaporation rates. The proximity of the Gulf of California, the Pacific Ocean, and the Gulf of Mexico, as well as the distribution of high mountain barriers in the region, influence the amount, apportionment, and seasonality of rainfall. The seasonality of precipitation is bimodal, with frontal Pacific storms occurring in late winter and early spring, and local and occasionally violent convectional storms (Arizona monsoons) occurring in late summer. The summer monsoon precipitation is usually intense, localized, and of short duration, often resulting in flash floods. Precipitation during the winter is not as dependable temporally but less erratic spatially, and is usually typified by gentle widespread rains of a much longer duration.

The allotments occur within the Basin and Range Geologic Province, which extends from northwestern Mexico to southeastern Oregon, and from the Colorado Plateau and Sierra Madre on the east, to the Sierra Nevada on the west. The Basin and Range is named for its numerous elongated mountain ranges alternating with wide alluvial valleys. The variability seen from range to range is attributable to differences in the kinds of rock that were uplifted, the extent of uplift, and the amount of erosion that has occurred.

Vegetation in these two allotments is very similar. The valley areas are dominated vegetatively by creosote (*Larrea tridentata*) and triangle leaf bursage (*Ambrosia deltoidea*) with some white bursage (*A. dumosa*) and range ratany (*Krameria parvifolia*). Other plants present include catclaw acacia (*Acacia greggii*), barrel cactus (*Ferocactus* spp.), wolfberry (*Lycium andersonii*), staghorn cholla (*Cylindropuntia versicolor*), and mesquite. The valley has some ironwood *(Olneya tesota*), and little-leaf paloverde (*Parkinsonia microphyllum*) along narrow washes. The more mountainous areas of these allotments are characterized by saguaro (*Carnegiea gigantea*), little-leaf paloverde, ironwood, creosote, triangle leaf bursage, range ratany, flat topped buckwheat (*Eriogonum fasciculatum*), brittle bush (*Encelia farinosa*), fairy duster (*Calliandra eriophylla*), barrel cactus, staghorn cholla, ocotillo (*Fouquieria splendens*) and various other cacti.

Status of the Cactus Ferruginous Pygmy-Owl in the Action Area

The Conley and Beloat allotments are in Zone 3 of the cactus ferruginous pygmy-owl survey zones (U. S. Fish and Wildlife Service 2000). To date, there have been no confirmed pygmy-owl occurrences within the action area. There have been unconfirmed records of pygmy-owls occurring in the Sand Tank Mountains, 15 miles south of the Conley allotment, but the nearest confirmed pygmy-owl location is more than 20 miles to the southeast in Pinal County.

The allotments are within the owl's historic range and, in places, contain components of suitable pygmy-owl habitat. Patches of vegetation associated with four earthen tanks (two on each allotment) contain dense stands of mesquite, blue paloverde (*P. floridum)* and wolfberry. These patches are considered to be of adequate size (>2 acres) and structural diversity to constitute suitable habitat for the cactus ferruginous pygmy-owl. All four earthen tanks have "water trap" fences around the water source. At all four sites the suitable pygmy-owl habitat occurs outside the fences surrounding the water source. Cattle are trapped at these waters when they come to drink and then moved by riders on horseback to facilities where they are loaded on trucks. All of the other livestock waters on both allotments were inspected and none were found to have suitable pygmy-owl habitat within ½ mile of the water source.

The hill sides within the allotments are generally sparsely vegetated. Some of the canyons and drainages are more densely vegetated and contain components characteristic of habitat suitable for the cactus ferruginous pygmy-owl. Suitable habitat occurs in several washes in the foothills and canyons of the Sierra Estrella Mountains and Maricopa Mountains.

The BLM Phoenix Field Office funded pygmy-owl surveys in various locations throughout south-central Arizona, including these 2 allotment during the spring of 2001. A total of 38 transect sites in south-central Arizona were surveyed. Each site was surveyed 3 times following the established protocol for large areas. Six transects were located on the Beloat allotment and 2 additional transects were located near its western boundary. Two transects were located on the Conley allotment, with 2 additional transects located to the west and to the southeast of the allotment boundary. No pygmy-owls were found in the action area.

IV. Effects of the Action

Because of the extremely low known pygmy-owl population levels, any action with the potential to disturb habitat known to be important to the pygmy-owl, could have detrimental effects on the owl's continued existence in Arizona. Such disturbance could have potentially adverse effects on the species' survival if it resulted in habitat alteration, nest abandonment, or simply disturbance of the normal behavior patterns of owls.

Potential effects of the action on the pygmy-owl include: 1) construction of range improvement projects (corrals, fences, pipelines, tanks, etc) that destroys nesting or foraging habitat; 2) planting or seeding of nonnative plants, and increased dominance of nonnative annuals caused by grazing, which together may alter fire regimes and increase the chance that a wildfire would occur in occupied pygmy-owl habitat (Schmid and Rogers 1988); 3) vegetation treatments that result in destruction of nesting or foraging habitat; 4) reduced productivity and vigor of desert ecosystems; 5) trampling and browsing of vegetation cover, including saguaros and their nurse plants; 6) reduction of cryptobiotic crusts; 7) soil erosion and compaction; 8) reduced water infiltration rates and increased runoff, leaving less water for plant production; and 9) harm or harassment of pygmy-owls, particularly in areas where cattle are gathered or where they water. Changes in the vegetation community can also result in decreased pygmy-owl prey base, increased susceptibility of pygmy-owls to aerial predators, lack of suitable nesting structures, and habitat fragmentation.

Direct Effects

Livestock gathering and unloading, which may involve hundreds of cattle, numerous vehicles, and many people, could potentially disturb pygmy owls if they occur nearby. Unloading of livestock is generally done near water sources to allow the cattle to become familiar with the location, gathering is also most easily achieved at water. Two of 19 water sources on the Beloat allotment and two of 12 water sources on the Conley allotment have suitable pygmy-owl habitat within ½ mile. The four water sources with suitable habitat within ½ mile, have water trap fences around the tanks and the suitable habitat is outside the fences. Unloading and gathering would not occur within 300 feet of suitable habitat at these four locations due to fence configurations, vehicular access limitations and habitat location.

Maintenance of the same four earthen tanks, while not occurring in the habitat areas and not destroying habitat, could result in disturbance to pygmy-owls should they occur nearby. No other water sources occur within ½ mile of suitable habitat. Maintenance of these four tanks will only be authorized between July 1 and December 31 to minimize potential effects to breeding pygmy-owls.

Indirect Effects

Potential Effects of Livestock Grazing on Natural Vegetation Communities

In Sonoran Desert scrub, pygmy-owls are typically found in very well-developed, thickets of desert vegetation. Grazing that reduces the structure and composition of desert scrub communities below the site's potential likely adversely affects the suitability of the site as pygmy-owl habitat. Although grazing in semidesert grassland and Chihuahuan Desert scrub can cause a decrease in grasses and increases in shrubby species (Bahre 1995, Holecheck et al. 1994), this effect has not been documented in Sonoran Desert scrub. Grazing can result in reduced shrub cover (Webb and Stielstra 1979) and reduced desirable shrubs (Orodho et al. 1990) in Mojave Desert scrub and Great Basin Desert scrub, respectively. Browsing of shrubs and young trees, trampling or browsing of saquaros and their nurse plants (Abouhalder 1992), and adverse effects to soils and cryptobiotic crusts (further discussed below) are mechanisms by which the structure and composition of Sonoran Desert scrub could be affected by grazing. Reduction in shrub, tree, and columnar cactus cover and regeneration would degrade pygmy-owl habitat.

Holechek (1988) and Holechek et al. (1998) found that, in desert scrub, average utilization rates of 25-35 % are appropriate for maintaining range condition. Monitoring results indicate that actual utilization does not exceed 15% on these allotments, while 78% of the Conley allotment and 74% of the Beloat allotment is in late seral or better ecological condition, and 92% of the Conley allotment and 98% of the Beloat allotment has a static or upward trend. Livestock grazing at the levels currently permitted on the Conley and Beloat allotments is adequate to maintain or improve the ecological condition of the habitat. Should ephemeral use be authorized, perennial forage will be monitored to ensure that utilization rates are limited to 30% or less.

Potential Effects of Livestock Grazing on Soils

Cryptobiotic crusts, consisting of lichens, fungi, algae, mosses, and cyanobacteria are important soil stabilizers of desert soils (Kleiner and Harper 1972, 1977; Belnap 1992). These crusts decrease wind erosion (Brady 1974 in Anderson et al. 1982) and have a significant effect on soil stability and rates of water infiltration (Kleiner and Harper 1972, 1977; Belnap 1992; Belnap and Gardner 1993). Cyanobacterial soil crusts have been shown to increase soil retention through absorbency of the polysaccharide sheath material that surrounds groups of living filaments. These crusts also act to increase the availability of many nutrients in sandy soils (Belnap 1992; Belnap and Gardner 1993).

Grazing caused considerable damage to cryptobiotic crusts resulting in less stable soil conditions at Navajo National Monument, Arizona (Brotherson et al. 1983). Areas trampled by humans in Arches National Park exhibited a 90 % lower infiltration rate than untrampled areas, resulting in overall water loss to the system (Belnap unpubl. report). Therefore, trampling may result in the reduction of soil stability, soil fertility, and soil moisture retention (Belnap 1992). Although the relationships between saguaros and cryptobiotic crusts have not been investigated, changes in soil characteristics due to trampling of cryptobiotic crusts by cattle could adversely affect saguaro establishment and growth. Recovery of cryptobiotic crusts may take a long time, especially for the lichen and moss components of the crust (Belnap 1992). Cryptobiotic crusts will not likely recover significantly from previous disturbances under a seasonal grazing regime. Without these crusts, the reestablishment of the potential natural community may not occur (Menke 1988).

Disturbance of soils, including cryptobiotic crusts, and removal of vegetation by grazing combine to increase surface runoff and sediment transport, and decrease infiltration of precipitation (Gifford and Hawkins 1978, Busby and Gifford 1981, Blackburn 1984, DeBano and Schmidt 1989, Belnap 1992, Belsky and Blumenthal 1997). Effects are cumulative and interactive. Loss of vegetation cover and trampling of soils promote further deterioration of soil structure, which in turn accelerates vegetation loss (Belsky and Blumenthal 1997). These changes tend to increase peak flows in drainages (DeBano and Schmidt 1989), making water courses more "flashy", which promotes erosion, downcutting, and loss of riparian and xero-riparian vegetation (Belsky et al. 1999).

The intensity of damage to cryptobiotic crusts and vegetation caused solely by cattle is assumed to be directly proportional to the stocking rate. Stocking rates would be temporarily increased when ephemeral grazing is authorized. The most severe impacts are expected in areas used for gathering and unloading cattle, watering sites, and salt licks. The four tank sites containing suitable pygmy-owl habitat also serve as watering and gathering/unloading sites. Thus, effects to habitat, such as vegetation removal, soil compaction (Orodho et al. 1990) and resultant reduction in soil moisture (Daddy et al. 1988) would be prevalent at these sites. It should be noted, however, that these four habitat patches are artificial. The habitat patches were created by dikes associated with livestock water developments and developed in the presence of the current grazing regime.

Potential Effects of Livestock Grazing on Saguaros

Effects to saguaros and their nurse plants resulting from grazing have been studied by several authors in Sonoran Desert scrub in Arizona. Saguaros may be affected both directly and indirectly by grazing activities. Direct impacts may occur from trampling of young saguaros, grazing of nurse plants which results in reduction or removal of protective cover, or grazing of the young saguaros themselves (Abouhalder 1989). Abouhalder (1989) noted statistical differences in the age structure of saguaros between grazed and ungrazed areas of Saguaro National Monument, which he attributed to the Monument's grazing history. Nurse plants, which shade sensitive saguaro seedlings (Shreve 1931), may be reduced by grazing, and germination sites may be adversely altered due to soil compaction, erosion, and reduced infiltration. Benson (1982) noted that seedbeds of saguaros have been locally obliterated by grazing. Neiring et al. (1963) found that enhanced reproduction of saguaros on slopes was correlated with reduced localized levels of grazing.

Steenbergh and Lowe (1977) examined saguaro density and recruitment within Saguaro National Park which, until recently, was grazed by livestock. In addition, Burgess (1964) examined saguaro populations on the Tonto National Forest. These studies found that in Sonoran Desert scrub, direct destruction of young saguaros has resulted from the trampling by cattle seeking shade and forage beneath the crowns of desert trees, particularly paloverdes and mesquite. They also found that livestock grazing has had the greatest impact in non-rocky habitats where germination, establishment, and survival of young saguaros are most directly dependent upon the physical protection of other vegetation. Grazing in rocky habitats has had far less impact upon young saguaro recruitment. They summarized that grazing has reduced the density of saguaro populations by decreasing the number of sites suitable for germination and establishment of young plants by increasing exposure to natural mortality-causing factors. Therefore, since most recent nest cavities used by pygmy-owls have been in saguaros in non-rocky habitat, activities which affect saguaro recruitment could be significant.

Livestock use is generally light and dispersed in areas where saguaro cacti occur on these allotments. Whether saguaros were ever a significant component of the specific ecological sites within the valley areas of these allotments is unknown, as there are no relict areas for comparison.

Potential Effects of Livestock Grazing on Fire Frequency

Grazing in desert scrub communities probably have mixed effects on fire frequency and behavior. Weedy nonnative plants, split grass (*Schismus barbatus*), checker fiddleneck (*Amsinckia intermedia*), filaree (*Erodium cicutarium*), Sahara mustard *(Brassica tournefortii*), and cheatgrass (*Bromus rubens*) have benefitted from grazing, while native perennial bunchgrasses, which are highly palatable grazing forage, have become less abundant in many areas (Berry and Nicholson 1984, Kie and Loft 1990, Minnich 1994). When nonnative annual plants cure, they can form continuous stands of fine fuels that carry fire. These fine fuels have resulted in increased fire frequency in desert scrub (Rogers and Steele 1980, Minnich 1994). Many desert shrubs and cacti, including saguaro, are poorly adapted to fire and decline in burned areas. For example, Esque et al. (2000) reported mortality of adult saguaros in excess of 20 % after a fire in desert scrub at Saguaro National Park.

While livestock grazing has contributed to the spread of nonnative annuals into desert scrub communities, livestock grazing can also reduce fuel loads, making it less likely that fire will occur. During years of abundant annual forage production, authorizing ephemeral grazing can reduce the likelihood of wildfire. The areas where saguaros occur in these allotments do not tend to produce continuous stands of fine fuels adequate to carry fire even during above average years. In recent history, all fire starts in these allotments have not spread to more than a few acres due to a lack of fuel continuity.

Potential Effects of Livestock Grazing on Prey Species

Grazing can affect densities of potential pygmy-owl prey. Jones (1981) found that grazing reduced lizard abundance and variety in a number of habitats in western Arizona. Pianka (1966, 1986) discussed the importance of vegetation structure, and found vegetation communities with increased plant structures supported more lizard species than those with less structure. In general, complex vegetation communities with a high degree of species diversity and structural heterogeneity provide habitat for many prey species including birds, insects, and mammals.

Pygmy-owls coexist with livestock grazing in Sonoran Desert scrub northwest of Tucson, in Altar Valley southwest of Tucson and in Mexico. Thus, although adverse effects to the pygmy-owl and its habitat may occur from livestock grazing activities, the birds are at least somewhat tolerant of this type of disturbance. The restriction of livestock grazing to the levels currently permitted on the Conley and Beloat allotments appears adequate to maintain the ecological condition of the habitat, and thus may sustain the quality of habitat necessary to support an adequate prey base for the pygmy-owl. The additional impacts of ephemeral grazing on potential prey species, however, remains unclear.

Summary of Effects

The allotments contain patches of suitable pygmy-owl habitat. Livestock grazing has the potential to adversely affect these habitat patches by changing the structure and/or composition of the vegetation community. Ephemeral grazing may accelerate this alteration and may result in an increase in the trampling and browsing of vegetation cover, including saguaros and their nurse plants. Ephemeral grazing may also exacerbate the reduction of cryptobiotic crusts and increase soil compaction, which may result in increased soil erosion, reduced water infiltration rates, increased runoff, and subsequently leave less water for plant production. Changes in the vegetation community can result in decreased pygmy-owl prey base, increased susceptibility of pygmy-owls to aerial predators, lack of suitable nesting structures, and habitat fragmentation.

Further, the proposed action has the potential to disrupt individuals from breeding, feeding, or sheltering activities, should pygmy-owls occupy the area. The potential for direct effects is greatest at the four tank sites, which contain suitable pygmy-owl habitat, and will be used as watering and livestock gathering/unloading areas. Livestock gathering and unloading, which may involve hundreds of cattle, numerous vehicles, and many people, could potentially disturb pygmy owls if they occur nearby. Direct effects to pygmy-owls are unlikely to occur because no owls have been found in the action area, despite recent surveys, habitats for the owl are limited in extent, and all known pygmy-owls occur further south in Arizona.

V. Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Because these allotments are almost entirely Federal land, there are relatively few cumulative effects expected for this area. The possibility of development of the private lands in and around the allotment always exists. However, should development occur, housing density would be expected to be low. Any future development may undergo section 7 consultation if Federal permits (e.g., section 404 Clean Water Act permits) or funding is required. Projects without a Federal nexus would be the subject of a section 10(a)(1)(B) incidental take permit if take of a listed animal was anticipated.

VI. Conclusion

After reviewing the current status of cactus ferruginous pygmy-owl, the environmental baseline for the action area , the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that livestock grazing on the Conley and Beloat allotments, as proposed, is not likely to jeopardize the continued existence of the cactus ferruginous pygmy-owl. We base these conclusions on the following:

1. Although the allotments are within the historic range of the pygmy-owl, there are no records of pygmy-owl occurrences in the action area. Pygmy-owl surveys conducted in the spring of 2001 also failed to detect pygmy-owls on these allotments.

2. Within these allotments, suitable habitat is restricted to a few washes in the foothills and canyons of the Sierra Estrella Mountains and Maricopa Mountains, and in the vicinity of the four earthen tanks discussed above.

3. Maintenance of existing facilities within ½ mile of suitable pygmy-owl habitat would be carried out as needed, but restricted to July 1 to December 31 to avoid potential effects to breeding pygmy-owls.

4. Utilization will be limited to 20% on perennial grasses, trees, and shrubs in the North and South Maricopa Mountains Wilderness areas, and 30% on the remainder of the allotments.

5. Should ephemeral use be authorized, perennial forage will be monitored to ensure that utilization rates are limited to 30% or less.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with terms and conditions provided in this incidental take statement.

Amount or Extent of Take Anticipated

We do not anticipate the proposed action will incidentally take any pygmy-owl based on the lack of any documented use by pygmy-owls in the action area, limited habitat available for pygmy-owls, and because all known pygmy-owls are located well to the south of the allotments. However, if a pygmy owl is located on or immediately adjacent to the allotments, additional actions may be warranted and the BLM should determine whether reinitiation of consultation pursuant to 50 CFR 402.16(b) is appropriate.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The BLM should conduct annual pygmy-owl surveys at the four tank sites containing suitable pygmy-owl habitat, *or* no livestock gathering/unloading should occur within 0.25 mile of suitable habitat during the nesting season (February 1- July 31).

2. The BLM should fund and/or conduct studies to determine the effects of ephemeral grazing intensities on the alteration of native plant communities, including such factors as the mortality of seedling trees, shrubs, and saguaros; disruption of soil crusts; soil compaction; and erosion.

3. The BLM should assist the Service in implementing the pygmy-owl Recovery Plan, once the plan is finalized.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

Reinitiation Notice

This concludes formal consultation on the proposed Livestock Grazing of the Conley and Beloat allotments located in Maricopa County, Arizona. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We have assigned log number 2-21-01-F-220 to this consultation. Please refer to that number in future correspondence on this consultation. If we can be of further assistance in this matter, please contact Suzie Hatten (x225) or Jim Rorabaugh (x238) of my staff.

/s/ David L. Harlow

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (PARD-ES)

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